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CRITICISMS AND DISCUSSIONS.

THE FINITENESS OF THE WORLD.

No problem has perhaps been more fascinating than the question as to the nature of infinity. Infinity is commonly considered as the mystery of mysteries, and such phrases as "the finite can not comprehend the infinite" have become commonplace arguments of agnosticism.

However, it seems to me that the nature of infinity is frequently misunderstood, and we ought to bear in mind that infinity is not and can never be an object of our sense experience. It is a demand or postulate of thought. If in mathematics, for instance, we construct a mathematical space as a scope of our operations we omit all particular and concrete existences and retain only the abstract idea of motion. So long as this motion can be continued we think of its field as being without limit, and this possibility is called infinitude. Accordingly infinitude is not a thing but a potential function. Infinitude is never actualized, it is thought of as being actualizable and from these considerations we conclude that mathematical space is infinite. If we have progressed into the unlimited field of our operations we can resume our motion and can continue our progress without ever coming to an end.

Infinitude is primary in our thought operations. Before we start to move from a given point the scope of our motion stretches before us endlessly in all possible directions, a condition which we call "infinite space." The finite is secondary. It is the product of starting from one definite place and halting at another place. Sects or limited lines, figures possessing boundaries, are definite products of mathematical constructions, and they are comparable to the concrete existences of the actual world.

There is one point to be heeded: it is this that every concrete existence carries in itself this potential factor which we call infinitude. We have seen that when the mathematician begins to build up his geometrical figures, he presupposes the idea of pure form, of the relational, of a scope of motion, which, as has been demonstrated elsewhere,* has been obtained by abstraction; but we must understand that the same is true of any objective existence, of particular and concrete things, and also of the world as a whole. The prevalence of motion presupposes a scope of motion, and unless there is some particular cause to set a limit to motion, the scope of motion is infinite. The same is true not only as to distance, but also to complications, combinations with other particular things and the innumerable modes of motion, which means that part and parcel of reality is its potentiality to pass through an unlimited chain of changes. We learn from this that potentiality is not a concrete bodily thing, but must after all be regarded as an efficient factor in the concrete world.

All the possible operations of a finite and definitely limited thing, its combinations with other concrete existences, its possible modes of motion, are infinite. In other words, though the maybe is not a material entity, it is a true factor in the material world, and in the same way space, though not a concrete thing, is an indispensable condition of actuality. In this sense man too, though a finite being, is a child of the infinite, and before every one of us stretches this grand mysterious realm of infinitude.

In spite of the awe which the unfathomable abyss of infinity has for us, I repeat that the idea itself contains nothing unclear, nothing contradictory, nothing mystical or mystifying, and in the realm of thought the idea of infinitude is simpler than the idea of any finite existence. We must only bear in mind that infinitude is never a thing but a potential, never a concrete and particular object but a function in operation which is thought without end.

In applying these considerations to the problem of the infinitude of the world we can only say that however unmeasurable the cosmos may be its concrete existence can not be infinite. The globe on which we live is a definite amount of matter with definite boundaries which, however, we may draw as we see fit, including or excluding the atmosphere, including or excluding the moon, according to the principle which for a special purpose we lay down as a standard of measurement. The same is true of the solar system and of the system of the Milky Way as well as of the probable existence of a higher system of many Milky Ways which by gravity or otherwise may be interrelated. One thing is sure that the entire cosmos of all concrete existences with its Milky Way or other systems of a still higher order, must be finite, for otherwise they could not be concrete. The concreteness indicates particularity possessed of definite limits, and thus we must come *a priori* to the conclusion that reality is necessarily finite. But this reality, as well as every atom, contains the potential function of infinitude. There is no boundary to its scope of motion; there is no limit to its possible formation and reformation; the infinite is always the background of the finite. The *maybe* is always the frame which surrounds the *is*.

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* See the author's *The Foundations of Mathematics*, pp. 61 ff.

The law of the conservation of matter and energy is no longer tenable if we understand by matter the chemical "elements" or the "mass" of the physicist. We know that chemical elements originate. The astronomer can watch their genesis in the several nebulas which we might fittingly call the gigantic retorts of creation. Similarly we may say that actual motion or kinetic energy originates from a state of stress or potential motion by some process which starts a world motion. As electricity is produced in a dynamo by shearing, as it were, positive and negative electricity, so the world-ether may have been in a state of rest until by some event a process was started which from this latent state produced the actual commotion needed for the procreation of the stellar universe.

The law of the conservation of matter and energy accordingly holds good only if we interpret its meaning in a broad sense, and the question of the infinity of existence would then be whether or not the amount of world-ether is limited, and the answer seems to be that it is a definite and concrete existence which is unmeasurable and inexhaustible but may be, or rather must be, of a definite amount. Should we assume that the existence of the ether is not definite, not concrete nor particular, we would have to attribute to it the mysterious qualities of the mathematical zero and only in this case should we be driven back to the old notion of the origin of the world from nothing.

Such are our notions of the infinitude or finiteness of the world from the standpoint of philosophy, and what Professor Arrhenius* says on this subject from the standpoint of the naturalist would bear out our considerations which are raised upon a purely *a priori* consideration of the nature of both infinity and finiteness. The problems which the idea of finiteness involves do not seem to me ripe for solution. They consist mainly in the consideration that if the world space is infinite while the world is finite, it stands to reason that we ought to lose both its matter and energy by scattering it into the infinite empty space, which, we must assume, surrounds this finite world. But assuming that concrete existence is always finite and that ether itself is concrete, which means that every particle of ether is always at a definite time in a definite space, we need not jump at the conclusion that actual existence scatters. We know that energy radiates into ether, but if we assume that the amount of ether itself is finite there is no reason to declare that the ether will scatter into the empty space in which it swims. It may be that the empty space possesses qualities which are radically different from the space filled by ether or by gross matter. It may act as a limit from which particles of ether are repelled and into which the radiant energy of light can not penetrate. Until we possess instruments by which we can empty space of ether itself and study the character of an absolutely empty space we can only conjecture what reaction matter and energy may suffer at the end of finite existence. The time when physicists will be able to experiment with absolutely empty space is not near at hand, and it seems best not to speculate on the subject where any proposition must be a mere guess.

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* See his article "The Infinity of the Universe" in the present number.

EDITOR.

THE DIVINE FIVE-FOLD TRUTH.[1]

It is the holy stillness of night. The world with its busy cares is asleep. And that is the witching hour of divine philosophy. In the silence, a Spirit comes to me and bids me write. Is it inspiration? Or is it the fever of the night's vigil? I do not know. But, somehow, my soul seems calm and I seem to see in a sort of mystic way the meaning of things which were dark before. At least I will obey the muse to-night and trust in the leading of the Spirit, for this seems like no human insight. Go on, sweet Muse. The night is young. I would feign revel in glorious discourse. At other times I have spoken through the long processes of logic. To-night, I would feign speak as an oracle.

THE DIVINE TRUTH OF "BEING."

First of all, there comes to me the old and divine truth of "being"—not static, inert "being," but centers of energy, conscious

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[1] A more technical statement of the five-fold truth can be found in various studies already published. These include "Time and Reality," *Psych. Rev. Monograph Series,* No. 26; "Space and Reality," *Journ. Phil., Psych. and Sci. Meth.,* III, pp. 533, 589; "Consciousness and Reality," *ibid.,* V, pp. 169, 225; "Energy and Reality," *ibid.,* V, pp. 365, 393; and "The Ought and Reality," *Int. Jour. Ethics,* XVII, p. 454.